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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/642,463

08/15/2003

Richard A. Gottscho

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04/16/2007

BEYER WEAVER LLP

P.O. BOX 70250

OAKLAND, CA 94612-0250

EXAMINER

TUROCY, DAVID P

ART UNIT

PAPER NUMBER

1762

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

04/16/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/642,463

Applicant(s)

GOTTSCHO ET AL.

Examiner

David Turocy

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-9, 11-24 and 26-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 28, 30-34, 37 and 38 is/are allowed.
- 6) ☒ Claim(s) 2-9, 11-24, 26, 27, 29, 34 and 35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 3/23/07.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment, filed 1/25/07, has been fully considered by the examiner. The examiner notes the amendment to claims 2, 11, 15, 18, 20, 21, and 28 and the cancellation of claims 10 and 25, with the addition of new claims 30-38.

Response to Arguments

2. Applicant's arguments filed 1/25/2007 have been fully considered but they are not persuasive.

The applicant has argued against the Bluck reference stating the reference fails to disclose alternating to effect the concentration of the plasma forming component in the zones. However, the examiner disagrees, inherent in the process of Bluck, which supplies ions to zones of the processed substrate at varying times results in such a claimed limitation. If the ions are stopped in one zone and started in another zone, the ion concentration must necessarily be effected.

The applicant has argued against Bluck failing to disclose gas as being supplied at a time multiplexed manner. The examiner disagrees. The ions are plasma forming components, which are formed at a time multiplexed manner. At the very least, it would have been obvious to one of ordinary skill in the art to have supplied gas from gas source 54 in a time multiplexed manner to supply gases into the chamber through the anode when the anode is being utilized to reap the benefits of only supplying gas when needed.

The applicant has argued against the Li reference stating the reference fails to disclose continuously switching, such a time multiplexing. However, while Li fails to explicitly disclose such a configuration, it remains the examiners position that Li discloses, at column 6, lines 42-57, the desire to control the balance of species distribution around the chamber among ions, radicals, and by products by controlling the flow rate into the zones of the chamber. In addition Li discloses providing any gas combination to be supplied into either zone by controlling mass flow rate and valves (Column 5, lines 10-18). It would have been obvious to control the amount of species distribution in the chamber by controlling the flow rates of the gases to each region, including not flowing the components, by continuously and alternatively switching the gas flow rate between no flow and flow between the different regions because by doing so one would have reasonably been expected to provide desired control of distribution and uniformity of the ions and radicals.

All other arguments not addressed above will be addressed in the rejections to follow.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2-9, 11-14, 35-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 requires the "plasma forming component being outputted into the first processing zone from a peripheral location of the process chamber" however it is unclear from the disclosure the metes and bounds of such a limitation. Since claim 13 requires the plasma-forming component to be gas, the examiner, for the purposes of applying prior art, is going to interpret such a claim to require the plasma forming component be outputted into the process chamber initiated from a peripheral location of the process chamber, see for example gas outputting into the process chamber occurring at a location within the process chamber, but initiated at an exterior location.

Claim 2 requires "continuously generating" a single plasma, however it is unclear how a plasma can be continuously generated. A plasma is generated once and then sustained as a plasma.

Claims 35 and 36 both include "the outer region" and "the inner region"; however such references lacks antecedent basis because the claims and the claims from which they depend only require a first and a second region. The claims should more reasonable depend from claim 38.

The other dependant claims do not cure the defects of the claims from which they depend.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

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applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 15 and 17-20 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent 6203862 by Bluck et al., hereafter Bluck.

Bluck discloses a method for processing a work piece discloses providing a processing chamber with a work piece, including a first processing zone and a second processing zone (figure 1). Bluck discloses continuously switching between outputting the plasma-forming component into the first zone without outputting into the second zone and outputting into the second zone without outputting into the first zone (figure 2-3, column 2, lines 35-39, column 4, lines 15-43). Bluck discloses the time multiplexing technique to supply plasma forming ion gas from a single source, therefore Bluck alternates during generation of plasma, therefore the gas forming component helps in continuously forming a plasma during a single processing event (Column 3, lines 50-58, Column 4, lines 34-42). Additionally the examiner notes, sustaining a plasma does not require a time limit for sustaining, only that a plasma is present during the continual switching, and plasma is broadly a gas that contains ions and electrons and it is the examiners position that during the process of Bluck some amount of plasma exists within the process chamber during the switching between the chamber zones.

Claim 18: Bluck discloses providing a plasma forming component of energy (Column 3, lines 50-58).

Claims 19 and 20: Bluck discloses providing the first plasma-forming component (gas) into the chamber alternately into each of the zones and also discloses providing

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energy alternately into each of the zones to form the plasma (Column 3, lines 50-58, Column 4, lines 34-42).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 2-8, 11-12, 14-16, 18, 21, 27, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5252178 by Moslehi

Moslehi discloses a method for processing a workpiece with a electrical plasma forming component from a single component source comprising providing a work piece in a process chamber with two zones, an outer periphery zone and a central zone

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(figures 1, 4). Moslehi discloses outputting the components to the second (periphery) zone without outputting the component to the first (central) zone (Figures 1 and 4).

Moslehi discloses the energy is supplied from an exterior point of the processing chamber (100, 108, 132) (figure 4).

Moslehi does not disclose outputting the component into the first process zone without outputting into the second processing zone and continuously switching between the two to effect the concentration of the component.

However, Moslehi discloses, at abstract, using the multi-zone plasma processing method with time multiplexed format using one or several power sources in order to control plasma density and uniformity as well as ion energies throughout the chamber. Therefore, it would have been obvious to control the amount of Rf distribution in the chamber by controlling the Rf power to each region, including not flowing the components, by continuously and alternatively switching the Rf power between power and ground between the different regions because by doing so one would have reasonably been expected to provide desired control of the plasma density and uniformity as well as ion energies throughout the chamber. The examiner notes, sustaining a plasma does not require a time limit for sustaining, only that a plasma is present during the continual switching, and plasma is broadly a gas that contains ions and electrons and it is the examiners position that during the process of Moslehi some amount of plasma exists within the process chamber because the process of Moslehi discloses control over the ion concentration.

As to controlling magnitude, timing, constituents, ratio of the plasma forming components to each zone and the timing for providing each component, these factors would clearly affect plasma density and uniformity as well as ion energies produced as these affect energy supplied to the zone of the processing chamber, therefore it would have been obvious to control these facts to control the distribution. Wherein the controller of Moslehi is connected independently to each of the power sources and electrode and therefore they are controlled separately.

10. Claim 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bluck in view of US Patent 5522934 by Suzuki et al., hereafter Suzuki.

Bluck teaches all the limitations of these claims as discussed above, and additionally discloses multiple plasma sources on the same side of a substrate to deposit a film using the same time multiplexing technique (Column 2, lines 20-38). However, the reference fails to disclose providing a central zone and an outer zone during deposition.

However, Suzuki, teaching of a method for plasma depositing a layer onto a substrate, discloses including multiple plasma sources on the same side of the substrate including, plasma gas injection holes located closer to the center and additionally plasma gas injection holds located at an outer area (Column 7, lines 37-67). Suzuki discloses such a formation provides uniformity of film formation as well as keeping a high efficiency (Column 7, lines 37-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Bluck to provide a central zone and outer zone during

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plasma deposition as suggested by Suzuki to provide a desirable film deposition with a reasonable expectation of success because Suzuki discloses providing plasma sources near the central region and outer regions on the substrate is known in the art to provide film uniformity and sustain film forming efficiency and therefore would reasonably be expected to effectively provide those benefits for the plasma deposition process as taught by Bluck.

Claim 25: Bluck discloses delivering the plasma-forming component to the process chamber continuously (Figure 2).

11. Claims 2-9, 12-17, 19, and 22-24 rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6009830 by Li et al., hereafter Li.

Li discloses a method for processing a work piece with a gaseous plasma-forming component from a single component source comprising providing a work piece in a process chamber with two zones, an outer periphery zone and a central zone (Column 3, lines 1-5). Li discloses outputting the components to the second (periphery) zone without outputting the component to the first (central) zone (Column 5, lines 45-48). Li discloses providing various components to the periphery zone and central zone, including a second plasma-forming component from a second source (Column 6, lines 14-16). Li discloses providing an electric field in the plasma chamber (Figure 1, column 3, lines 26-28). Li discloses an external electrode (24) (figure 2).

Li does not disclose outputting the component into the first process zone without outputting into the second processing zone and continuously switching between the two to effect the concentration of the component.

However, Li discloses, at column 6, lines 42-57, the desire to control the balance of species distribution around the chamber among ions, radicals, and by products by controlling the flow rate into the zones of the chamber. In addition Li discloses providing any gas combination to be supplied into either zone by controlling mass flow rate and valves (Column 5, lines 10-18). It would have been obvious to control the amount of species distribution in the chamber by controlling the flow rates of the gases to each region, including not flowing the components, by continuously and alternatively switching the gas flow rate between no flow and flow between the different regions because by doing so one would have reasonably been expected to provide desired control of distribution and uniformity of the ions and radicals. The examiner notes, sustaining a plasma does not require a time limit for sustaining, only that a plasma is present during the continual switching, and plasma is broadly a gas that contains ions and electrons and it is the examiners position that during the process of Li some amount of plasma exists within the process chamber because the process of Li discloses control over the ion concentration.

As to controlling ratio of gas components to each zone and the timing for providing each component, these factors would clearly affect the amount of distribution of ions and radicals produced as these affect the amount of gas present for the production of such ions and radicals, therefore it would have been obvious to control

these facts to control the distribution. Wherein the controller of Li is connected independently to each of the gas source lines and therefore they are controlled separately.

12. Claims 11 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li in view of US Patent 6113731 by Shan et al., hereafter Shan

Li teaches all the limitations of these claims as discussed above in the 35 USC 103(a) rejection above and discloses the desire to control the distribution of ions and radicals throughout the process chamber but Li fails to disclose providing controlling energy in the first and second zones.

However, Shan discloses a plasma chamber including controlling the energy throughout the process will result in control of the ion distribution and increase spatial uniformity, thereby reducing the risk of damage to the substrate.

Therefore it would have been obvious to one of ordinary skill in the art to modify Li to selectively control the energy within the plasma chamber as taught by Shan with the reasonable expectation of improving ion distribution throughout the process chamber and reap the benefits of reducing the damage to the substrate during processing.

Allowable Subject Matter

13. Claims 28 and 30-34, 37-38 are allowed.

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14. Claims 35 and 36 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

15. The following is a statement of reasons for the indication of allowable subject matter: None of the prior art cited or reviewed by the examiner clearly discloses two time multiplexing operation, which are different from each other, to supply gas and/or energy to the inner and outer section of the process chamber.

Conclusion

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Turocy whose telephone number is (571) 272-

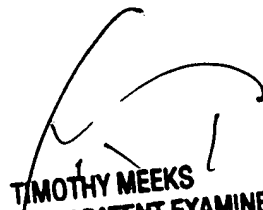
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2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

David Turocy
AU 1762


TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER